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A CASE OF FOCAL EPILEPSY SUCCESSFULLY  
TREATED BY TREPHINING AND EXCISION  
OF THE MOTOR CENTRES.

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AND  
JOHN B. DEAVER, M.D.

*Medical Report by Dr. Lloyd.*

The following case was admitted into the nervous wards of the Philadelphia Hospital under the writer's care, early in the past spring :

J. W. G., aged thirty-five years, American born. Mother died of phthisis, father of paralysis. Patient has had the usual diseases of childhood. He denies positively ever having had any venereal disease. When fifteen years old he was struck on the head with a ball-bat, from which blow he became unconscious and was confined to bed for one week. Further details of his condition at that time are not obtainable. His fits did not begin until six years after. Fourteen years ago he had his first seizure while asleep. In this he bit his tongue. The question arises whether this was his first fit, or whether really it was not rather his first *discovered* fit by reason of the wound of his tongue. Probability is lent to the latter supposition by the fact that many of his seizures have been nocturnal. Nine months after his first discovered fit he had his first seizure during the day. After this time he had them varying in number and intensity until admitted to the hospital. He described his seizures as follows: He would have a decided sensory aura

commencing in the fore and middle fingers of the left hand, extending up the arm, through the neck to the left side of the head, when the convulsion would begin. He has stopped the aura at times, and thereby the fit, by tightly compressing the wrist. The aura lasted quite an appreciable time, and gave him ample notice of the explosion.

During the time of the patient's early sojourn in the hospital his seizures were mostly nocturnal. He was conscious of many of these. He said they lasted but a short time, involving, as a rule, only the left face and arm, and that he did not always lose consciousness. He also said that he has had occasional attacks involving both sides of the body, but his accounts of these were not clear, and it is probable that his consciousness was lost or obtunded in these greater attacks. The few minor attacks, which happened in the daytime, occurred during the absence of any trained or intelligent observer, but several of his fellow-patients confirmed in the main his own account.

In order to render the diagnosis more positive and the description more exact, Dr. F. W. Talley, resident physician, began a systematic nocturnal watch upon the patient, without the latter's knowledge, sitting up in constant vigil several nights in succession. During the first night nothing was observed, although the patient said in the morning that he was sure he had had one or two slight seizures. In the second night Dr. Talley succeeded in observing a characteristic attack, which he describes as follows:

The fit commenced in the left arm. The fingers were flexed over the thumb, the hand flexed at the wrist, the forearm flexed upon the arm. The head was drawn over to the *right* side, the right arm and leg then became rigid. The head soon began to rotate to the left, the fingers of the left hand relaxed, the mouth opened and was drawn to the left side with the right angle depressed. As soon as the face reached the median line a series of clonic spasms began in the left arm and left side of the face. (In two of his most severe attacks clonic spasms were observed in his right arm.) The pupils were widely dilated and fixed. Consciousness appeared to be preserved, partially, at least,

throughout. The spell was of very brief duration. Following the fit there was well-marked paresis of the left arm and left side of the face.

These memoranda by Dr. Talley very faithfully describe the main features of the attack. The frequency of the seizures, on account of which the patient had applied to the hospital, increased, and they occurred both day and night, so that they were soon observed by the nurses, members of the resident staff, and by several of the neurological and surgical staffs, who were called in consultation. The greatest number of seizures recorded in one day was twenty-eight, at which time the patient seemed to be passing into a veritable epileptic status, being confined to bed, and becoming very dull and altered in his mental condition.

The paresis of the left face and arm at this time began to be very noticeable. The face was relaxed, the angle of the mouth depressed, and the right or sound side drawn over perceptibly. The orbicularis palpebrarum muscle was not involved. The tongue was not paralyzed (?). The pupils were equal and responded to light and accommodation. The arm was perceptibly weakened, especially in the flexors of the fingers and wrist, the biceps, and the deltoid. These muscles were not wasted, and did not present any reactions of degeneration. On those days when the patient's fits were infrequent this paretic state of the muscles improved considerably in the longer intervals, and was most marked just after a seizure. There was no alteration or retardation of tactile sensibility. An examination of the eye-grounds at this time by Dr. de Schweinitz revealed nothing indicative of organic cerebral changes.

The onset of these seizures, upon which special stress was laid both in the diagnosis and subsequent surgical treatment, was always the same, and verified by numerous observations. The left hand, especially the two fingers, was the seat of the signal symptoms, both sensory and motor, and, however varied the extent of the convulsive wave in different seizures, there was never any variation from this constant initiation. The convulsive area varied considerably, from a slight twitching of the affected face and arm,

with no apparent loss of consciousness, to an almost universal bilateral convulsive explosion, always worse, however, on the left side, with decided obscuration of consciousness. This loss of consciousness was not always as great as it appeared, for once after a severe seizure, during which I asked him some test questions, he answered them correctly as soon as he regained control of his muscles. The patient complained but little of headache and said it had never troubled him; the slight degree of it from which he suffered in the hospital appeared to be an effect of his rapidly increasing seizures. He had no gastric irritability whatever.

It seemed very evident to my mind in studying this case that we had a focus of discharge in the region of the junction of the middle and lower third of the ascending frontal convolutions on the right side, possibly involving also contiguous portions of the ascending parietal convolutions in which experiment seems to have demonstrated centres for the hand and wrist. The nature of this irritative lesion did not appear very clear to me, although I was inclined to think it might be old scar tissue and thickened membranes, the results of his injury. I considered the long duration of his affection to contra-indicate a tumor, especially as he had neither headache, vertigo, vomiting, nor changes in his eye-grounds; although the focal nature of the discharge and the more or less constant paresis of the convulsed muscles were very suggestive of a new growth. I saw no reason to doubt the man's sincerity on the subject of syphilis, but I classed him with the rest of mankind and gave him the benefit both of the doubt and the iodides. He did not improve. A consultation was held with my colleague, Dr. John B. Deaver, of the surgical staff, and an operation discussed. At a subsequent consultation with Drs. Deaver and Sinkler the operation was decided upon, with the concurrence also of Drs. Mills, Dercum, and de Schweinitz, who kindly saw the case by invitation.

On the 12th of June Dr. Deaver operated in the presence of the above-named physicians and with the assistance of Dr. J. William White. The details of the operation and the surgical aspects of the case will be narrated by Dr.

Deaver. It had been decided beforehand that the incision should be simply an exploratory one in case nothing was discovered in the membranes or cortex, unless by faradic stimulation we should succeed in locating the irritative area in the cortex, in which case it should be cut out. By following Reid's and Horsley's lines, Dr. Deaver exposed, with an inch and a half trephine, an area which appeared to include both sides of the central fissure (Rolandic) in the region of the junction of the lower and middle thirds of the ascending convolutions. This area was afterward much enlarged, especially in the anterior direction, by the Hopkins' modification of Rongier's forceps. Nothing abnormal whatever was discovered in the bone, membranes, or cortex by gross inspection. The difficulty of identifying the parts was so great that exploration was soon begun with a faradic current, and with very gratifying results. Upon faradizing a point back of the fissure of Rolando, more properly the wrist centre, according to Ferrier, muscular contractions occurred as follows: turning in of the thumb on the palm, flexion of the fingers, flexion of the wrist, extending to flexion of the elbow (biceps action). I cannot say that it was verified topographically—*i. e.*, by appearance of fissures and convolutions seen in the wound, what exact centres were here excited. It was behind what appeared to me to be the Rolandic fissure. The difficulty of identifying fissures and convolutions in a small trephine wound appears to me to be extraordinary. What is of greater importance was, however, here accomplished; the reproduction of the exact muscular movements which occur in the fit. At a point farther front and below, and in front of the fissure seen in the middle of the wound (Rolandic?), faradic stimulation caused marked contraction of the face-muscles of the affected side. The mouth began to contract, and was drawn toward the left side with a tremulous motion, and soon the tongue began to protrude toward the left corner of the mouth. Soon the left thumb began to be contracted and adducted into the palm; the fingers were contracted into the palm and about the same time the face muscles began to contract more actively, while the head was drawn

to the left side, and the left eyelid began to work. At the same time the hand was gradually closed, and contraction of the forearm and arm began, while the latter was drawn from the side to an angle of forty-five degrees (deltoid action), and contractions of the biceps occurred. At no time in the course of the faradic applications, anywhere within the area exposed by the trephine and forceps, did any contraction of the leg muscles occur.

I observed especially, in making these applications of faradism to the cortex, that considerable areas of it did not appear excitable at all to the strength of current employed, at least did not give muscular response anywhere, while the two comparatively narrow points above mentioned reproduced almost exactly the muscular contractions of the epileptic seizures, and seemed to stand for more "centres" than the diagrams of those who have experimented would allow to any such narrow areas.

In the absence of any visible organic lesion it was decided to excise these portions of cortex. The possibility of a sub-cortical tumor was not ignored, but there was absolutely no evidence of such in any alteration of the vascular supply or of the consistency of the brain tissue. The parts did not bulge into the wound, nor was the color of the gray matter in any way changed. Accordingly, Dr. Deaver excised from the region back of the central fissure a portion about twelve millimetres square, carrying the incision well down to the white matter. Two small portions were removed from the excitable region anterior to the central fissure. Further exploration by means of these incisions failed to detect any tumor. My attention had not been called at that time to the distinction which Franck<sup>1</sup> makes between the faradic excitability of the gray and that of the underlying white matter. This distinction is that the gray matter gives rise to a series of clonic spasms in the related muscles, epileptiform in character, continuing even after the faradism is withdrawn, while the white fasciculi, when faradized, cause a tonic contraction which ceases at once on

<sup>1</sup> *Lecons sur les Fonctions Motrices du Cerveau, etc.*, par le Dr. Francois Franck, Paris, 1887, p. 107.

withdrawing the poles. I am quite positive that the contractions caused in our patient by stimulating the gray matter were epileptiform—and if my memory serves me, after this lapse of time, the white fasciculi at the bottom of the wound were also touched and caused but a momentary tonic contraction.

The patient's condition after the operation may be briefly epitomized as follows, prefacing with the remark that he was watched by competent observers day and night and the nursing records kept in a book.

It was observed from the first that he slept with his left eye partly open. The legs moved freely and were never paralyzed. The left arm was markedly paretic, lying quite flaccid by his side; he would occasionally raise it by taking hold of it with his right hand. His left face was also paretic. Late on the first night he had his first convulsive movement; it was only a slight twitching of the left side of the mouth which was thus drawn to the left side. These twitchings of the face, accompanied occasionally by twitching of the left hand and forearm, continued at intervals during the first six days, when they ceased, and the patient has never had any convulsive movement whatever since. They were not so severe as before the operation, nor so widespread. About the third day there was some stiffness of the fingers, which may possibly be explained by irritation of the white fasciculi during the process of healing of the cortical wound. There was at this time, according to the nurse's records, a difference in temperature of the two sides, the left axilla being from one to one and a half degrees higher. After one of his twitching spells the patient spoke of the spells returning, but he never mentioned his aura.

On the fifth day his muscular condition was as follows: The flexors of the wrist and fingers were almost quite paralyzed. The biceps was much weakened. The pronators and supinators were paretic. When told to raise the arm he would reach for it with his sound hand, and when restrained in this he would raise the affected arm with a sort of fling and evidently with the aid mostly of the shoulder and chest muscles. All his attempts to move the paralyzed

muscles, especially to close his fist, were accompanied by analogous movements of the right arm. All the muscles of expression of the left face were affected, as well as the left side of the occipito-frontalis. He had control of the orbicularis palpebrarum. When he laughed the muscles of the paretic side appeared to respond almost as well as those on the sound side; which seemed to show that a cortical paralysis is not absolute as far as bilaterally associated movement is concerned. The patient is right-handed, and has never been aphasic.

From about the sixth until the eighteenth day the patient cannot be said to have been at any time in his normal mental state. He became dull, then lachrymose and incoherent, and for a part of the time had marked maniacal delirium with hallucinations of sight and hearing. The surgical condition did not seem adequate to account for this. The operation and subsequent treatment had been conducted with strict antiseptic precautions, and the patient never had a serious rise in temperature. There appeared to be headache at times, as he frequently attempted to pull off his dressings. There was at this time much œdema of the scalp. While he was at his worst there was some priapism, and one of the resident physicians was confident that the patient had masturbated. I doubt if the patient in his condition at the time was conscious of it. The pupils were dilated and the eyes expressionless. There was one involuntary passage of urine. During his most delirious and restless stage it was thought that he did not move his left leg as much as the right, but if so, this was the only time the leg was affected. His left face became much more flushed than the right. From this ominous condition he began gradually to improve toward the end of the third week, until he could sit up, and so gradually began to get about. By the end of the fifth week he was practically well, and had recovered some of his lost muscular power.

The following memoranda have been made quite recently (three months after the operation) of the patient's condition. He has had no convulsive seizures whatever since his convalescence.

*Sensory condition.* (Patient blindsfolded). In the left, or affected hand, he feels the slightest touch with the blunt points of an aesthesiometer. There is no retardation. On the forefinger he does not discriminate the blunt points one inch apart, but he tells the sharp points one-quarter inch apart. In the other fingers and on the right hand he discriminates better. With weights varying from *two to twelve* ounces, patient is able to tell the heaviest by cutaneous pressure as well on affected as sound side. (The paralyzed hand has a more delicate skin from disuse.)

The patient is not able to distinguish form when an object is placed between his forefinger and thumb; thus he appears quite unable to tell a small square object, a silver quarter, a silver dollar, a small flower, or a penknife. It is evident, however, that this is not a sensory but a muscular defect, because his fingers are still so paretic that he holds these small objects in the most awkward way, and cannot move or twist them about in his fingers; hence he is not able to bring his sensory nerve endings in rapid contact with the outlines of these things. This cannot, therefore, be quoted as a proof that muscular sense is in the motor cortex. His sensation to pain and heat is perfect.

*Motor condition.* With a dynamometer his right hand registers 130, his left hand 20. He makes a great effort, straining even with his facial muscles. The paretic face is slightly flushed. He says there is no difference in the sweating. In the left face the tactile sense is quick and perfect. He cannot close the left eye by itself, but closes both together—a further evidence that bilaterally associated movements are not lost in cortical paralysis. The left face is still markedly paretic and the tongue deviates to the left. The muscles especially paralyzed in the arm are the flexors of the fingers. The forefinger and thumb are notably weak and awkward. He has good control of the flexors of the wrist. The biceps contracts firmly. He says he has a feeling of weakness about the shoulder, and his arm moves awkwardly, but the deltoid and individual muscles are apparently about normal. The regain of power is rather greater than was expected.

Dr. Allen J. Smith makes the following report of the appearances of the excised tissue:

"Three pieces were referred to me for examination; one governing arm alone and the other two arm and face movements. Stained by Weigert method. Those sections from piece governing arm alone (post to fissure of Rolando), each showed numerous foci of infarction, apparently recent and possibly due to some violence to the tissue during operation. There was possibly some degeneration in the cortical substance, but at most very slight. In the large pieces governing arm and face (taken from anterior to fissure of Rolando) there is a distinct degeneration of the large multipolar pyramidal cells, with the same foci of hemorrhage as in the smaller pieces. A number of these large cells seem to be in a condition approaching fatty metamorphosis, and small granular bodies, like fat drops make up the bulk, which is less than usual, and in most cases shrunken away from the walls of tissue about the cells. These degenerated cells refuse to take the stain as well as their comrades that are undegenerated."

In closing the account of this case it seems proper to offer a few special observations. As far as I am aware, there have been two cases operated on in which no discoverable lesion was present and in which the irritable area was mapped out with faradism and removed. There may, of course, be others. The two to which I refer are one of Mr. Horsley's cases,<sup>2</sup> and one operated on by Dr. Keen, of Philadelphia. The propriety of the operation is to be decided upon in individual cases, and cannot yet be made the subject of a general rule; it must depend largely upon special features, as, for instance, the strictly focal character of the fits, their severity and frequency, and the extent to which they destroy usefulness or jeopardize life. Macewen<sup>3</sup> discusses the propriety of removing large wedges of brain-cortex, and lays much too great stress, it seems to me, upon the evils of producing hemiplegia in trying to cure fits—to which it may be said, in the light of this case that,

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<sup>2</sup> British Med. Journal, April 23, 1887.

<sup>3</sup> British Med. Journal, August 11, 1888.

first, in curing focal epilepsy it may not be necessary to cut out such large wedges as to produce hemiplegia, and, second, the evils of a partial monoplegia are certainly not to be compared with the direful effects of frequently repeated epileptic seizures.

SURGICAL REPORT BY DR. JOHN B. DEAVER.

J. W. G., on June 11, 1888, the day previous to the operation, had his bowels moved freely with a saline purgative; his urine carefully analyzed and examined microscopically, showing it to be normal; and his chest examined with negative results. He was given a warm water bath, followed by a boric acid bath, then the entire scalp was closely shaved, washed with turpentine and scrubbed with soap and water, then washed with ether and alcohol, when it was enveloped in a towel wrung out of 1:1000 solution of the bichloride of mercury. Here, I feel justified in saying that part of the success of all operations is attributable to the careful preparation of the patient. During the operation the following day, June 12th, the most strict antiseptic precautions were observed.

*Operation, June 12th, 11 A. M.*—The patient was placed on the table for operation. A hypodermatic injection of one-quarter grain of sulphate of morphia was given immediately before the anæsthetic was administered, the object being to contract the arterioles and thus lessen the amount of bleeding. Chloroform was administered until the patient was fully under its influence, when sulphuric ether was substituted and continued throughout the operation. In the presence of the neurological staff of the hospital, and assisted by my colleague, Dr. J. William White, I first mapped out upon the scalp of the right side of the head, the seat of operation, the fissures of Sylvius and Rolando by using Reid's lines (see *Lancet*, 1884, p. 359), which I will describe. First, draw a line, which runs from the lower border of the orbit through the centre of the bony meatus of the ear. To find the fissure of Sylvius, draw a line from a point one and one-quarter of an inch behind the external angular process of the frontal bone to a point three-quarters

of an inch below the most prominent part of the parietal eminence. Measuring from before backward, the first three-quarters of an inch of this line will represent the main fissure and the rest of the line the horizontal limb. The ascending limb starts at the point indicating the termination of the main fissure—*i. e.*, two inches behind the external angular process, and runs from this vertically upward, for about an inch. The fissure of Rolando is found by drawing two lines from, and perpendicular to, the base line to the top of the head, one passing through the depression in front of the ear and the other through the posterior border of the mastoid process. The fissure of Rolando is now represented by a line drawn from the point of intersection of the posterior vertical line with the line connecting the nasal eminence with the external occipital protuberance, indicating the great longitudinal fissure, to the point of intersection of the anterior vertical line with the line representing the fissure of Sylvius, upon either side of which are the ascending frontal and parietal convolutions containing the centre we wished to remove in this case.

I prefer Reid's lines to Broca's, Lucas Championnière's, Hare's, or Wilson's method of locating the fissures, as I have proven them upon the cadaver to be quite as correct as any of the others, and I think simpler and more comprehensible; and again, as they map out more fissures than do the others, as brain surgery advances they will be more useful. Over and a little in advance of the middle third of the line representing the fissures of Rolando after all the layers of the scalp, including the periosteum, had been dissected up by making a large horseshoe-shaped flap, with its convexity downward and forward, thus favoring drainage, a trephine one and a half inches in diameter was applied to the skull and a section of bone corresponding in size to that of the trephine removed. Thus far both the soft parts and the bone were perfectly normal, there being not the slightest evidence of depression of the latter. The dura mater, which now presented at the bottom of the wound intact and normal, was incised and reflected, thus laying bare the arachnoid and pia mater, both of which

membranes to the naked-eye appearances were healthy. Before incising the hemisphere (to make sure we were over the proper area) Dr. J. Hendrie Lloyd applied electrodes which had been wrapped with sublimated cotton, and which was lying in a 1:1000 solution of the bichloride of mercury, to the surface of the brain thus far exposed, with the result of bringing about movement of the fingers and wrist but not of the forearm, when I, with a pair of Hopkins' modification of Rongier's forceps, cut away several small pieces of bone from the anterior margin of the opening made by the trephine, Dr. Lloyd again applied the electrodes when the forearm was flexed and supinated, the angle of the mouth elevated, and the face muscles contracted. A saturated solution of boric acid containing four per cent. of hydrochlorate of cocaine was now applied to the arachnoid and pia mater to contract the blood-vessels of the latter membrane. With an ordinary sized scalpel, held perpendicularly, three pieces of brain tissue, each three-quarters of an inch in depth, were removed, one-half an inch square in size, back of the fissure of Rolando, and two smaller portions anterior to the Rolandic fissure.

The cut vessels of the pia mater were ligated with fine juniper-oiled catgut, and hot water applied to the surface to check the oozing; the latter proved to be very efficient. A few strands of heavy juniper catgut were placed in the bottom of the wound and the flaps of the dura mater approximated over it and sutured with catgut. Again, a few strands of heavy juniper catgut were placed in the wound, resting on the sutured dura mater, the skin flaps approximated and sutured with silver wire. The wound was dressed antiseptically (bichloride of mercury being used), and the patient sent back to the ward.

The temperature of the patient after the operation was 97° Fahrenheit; in the evening of the same day 99°; pulse 98; respiration 15. Ordered milk and lime-water.

*June 13.*—Temperature 99 $\frac{1}{2}$ °, pulse 94, respiration 16. Dressings not soiled; bowels moved slightly. Ordered potass. bromide, gr. xx, every four hours.

*14th.*—Dressings slightly stained; wound dressed, when

found to be completely sealed. No discharge. Pulse, respiration, and temperature normal.

*15th.*—Dressing not disturbed. No pain. Pulse, respiration, and temperature normal.

*16th.*—Dressings slipped. Wound had to be dressed. No discharge.

*17th.*—Patient not quite so well; is restless, showing some evidence of cerebral irritation. Complains of some pain in the head. Pulse 84, respiration 16, temperature 100°. Wound dressed and found healthy. No discharge. The scalp behind the wound is œdematosus. Ordered ice-bag to the head, and calomel,  $\frac{1}{4}$ , with Dover's powder, gr. ij, every three hours.

*18th, 11 P. M.*—Patient, while asleep and dreaming, tore off his dressings. Wound dressed, when the inner dressing alone was found slightly stained with bloody serum, otherwise healthy. Scalp still œdematosus. Patient's general condition much better. Bowels were moved after the administration of a simple enema.

*19th.*—Wound dressed, six sutures removed, allowing three to remain. The points from where the sutures were removed were touched with solid stick of nitrate of silver.

*21st.*—Patient more restless than the day previous. Pulled at the dressings, necessitating a redressing of the wound, which was found free from discharge, and healthy. Pulse, respiration, and temperature normal.

*25th.*—Patient attempted to remove his dressings, but was not successful. The dressings were removed, when the wound was found to be healed. The three remaining sutures taken out, and the points corresponding to the site of the sutures touched with solid stick of nitrate of silver. The part of the scalp covering the trephine opening was quite prominent, and upon palpation fluctuation was detected. I made an incision into the scalp here at two points, evacuating bloody serum only. I then introduced a small rubber drainage tube and dressed the wound. Pulse, respiration, and temperature normal. Patient complains of no pain; tongue dry; calomel and Dover's powder stopped. Ordered whiskey half an ounce, two grains

of quinine every four hours, and also three drops of turpentine, in emulsion, every six hours.

*27th.*—Wound dressed, drainage tube behaving nicely, very little discharge.

*28th.*—Bowels were moved after an enema had been given.

*29th.*—Wound dressed. Still some little serous discharge through the drainage tube. Stopped emulsion of turpentine, but continued with the quinine and whiskey.

*July 1.*—Bowels moved twice during the night. Patient comfortable and doing well in every respect.

*2d.*—Wound dressed. Drainage tube removed.

*3d.*—Three weeks since the operation, patient allowed to sit up.

*4th.*—Bowels moved.

*6th.*—Wound dressed, very little discharge of serum from tract of drainage tube.

*12th.*—Wound dressed. Still a little discharge of serum from tract of drainage tube. No pain or tenderness on pressure. The pulsation of the brain at the centre of the flap covering the trephine opening in the skull was very marked.

*17th.*—Wound all healed. No further dressing applied. Patient entirely well. Walks about the hospital.

The deductions which I would draw from this case are that this, as well as other cases, proves that excision of parts of the brain can be done with, I may say, perfect impunity; therefore, in the case of a lesion the nature of which is doubtful, and which in a short time will destroy the patient's usefulness if not his life, why not here, as well as in the abdominal cavity, make an exploratory incision? I think our success is due, largely, in these cases to the precaution taken in regard to strict cleanliness.

Since Mr. Macewen has practised putting back the button of bone removed in trephining and obtaining union, you may ask yourselves, Why did I not likewise? Notwithstanding I had subjected the large button of bone, as well as the small pieces removed in my case, to the proper treatment, preparing them to be reposed, I do not think

it worth while to place back so large a piece, as I had seen this done in the practice of two of my friends, and in both cases it necrosed and had to be removed; neither did I have at hand the proper instrument with which to divide the large piece of bone into small pieces or resolve it to bone-dust. Had I done the latter and placed it in the wound, it would not have been safe, owing to my not having absolute apposition of the flaps of dura mater, in which event, the brain would have been subjected to irritation, from the presence of the small particles of bone. The last examination made of this case, September 14, 1888, by Dr. Lloyd and myself, shows the opening, with the exception of a point at its centre, a quarter of an inch square, to be filled in with bone. At the point referred to very slight pulsation of the brain can be detected. Here we have had regeneration of bone from the periosteum, therefore, I am now well satisfied with the course I pursued and feel sure before long the entire opening, made in the skull at the time of the operation, will be closed by bony plate.

#### DISCUSSION OF DR. LLOYD AND DEAVER'S PAPER.

DR. DAVID FERRIER, of London, congratulated the gentlemen upon the success of the operation. It was perhaps, however, a little early to say that the case was cured. In several cases of his own of the true Jacksonian type of focal epilepsy without loss of consciousness he had excised and the patient had not been cured. He referred particularly to the case of the son of a medical man in whom after a blow on the side of the head there had been epileptic seizures, beginning in the left hand. Lister had trephined, expecting to find a spicule of bone; but the skull was not even thickened. Horsley had subsequently repeated the operation, but the attacks had not subsided. Even though begun as a local lesion, the removal of this lesion does not always effect cure, the system having apparently become habituated to the attacks. The sooner such cases were operated upon the better. The motor paresis in Dr. Lloyd's case favored the assumption of an organic lesion. Cases having an organic lesion were more apt to recover. He

inquired whether the paresis referred to continued between the intervals of the attacks.

DR. LLOYD replied that it was diminished during the intervals, but that it never entirely disappeared.

DR. FERRIER referred to the symptoms of postepileptic hemiplegia as possibly of the same character. Cases of operation for traumatic lesion with thickening of the membranes do well. He referred to the case of a young man who received an injury over the posterior extremity of the superior frontal and the ascending frontal convolutions when eight years of age. Ten or twelve years had elapsed before the operation, when he was having as many as three hundred fits in fourteen days. The cicatrix and thickened tissue was removed. Three years had since elapsed and the patient remained so much improved as to be able to earn his living.

The case of Dr. Lloyd was interesting also as a physiological experiment. He understood that there was paralysis after the operation while the tactile sense was perfect, any difficulty in distinguishing objects being evidently due to impairment of the mechanism upon which associated movements depends. The speaker inquired whether Dr. Lloyd had tested the sensibility by passive movements. The case was interesting as a proof that after the removal of the motor centres the tactile sensibility was preserved.

Mr. VICTOR HORSLEY, F.R.S., of London, referring to the question of recurrence in epilepsy, cited a case in which the facial region was excised after stimulation with faradism. Lingual equilibrium was obtained, which was not present before the operation and the fits were absent for three weeks, when they returned. The speaker referred to another case, in which after excision of a focus there had been no fits for two years, and to another, operated upon twenty-three months ago, in which there had been no fits since. He would not, however, venture to say that the case was cured. In his opinion five years should first have elapsed. To free the patient from epileptic attacks for six months or two years would, however, restore mental power and was no insignificant result. He agreed with the pre-

vious speaker that the operation should be done as early as possible. The faradization of the cortex for the purpose of diagnosis was a step in advance. He had himself irritated the corpora quadrigemina in one case without unfavorable symptoms.

Referring to the muscular sense, the speaker stated that it had two phases, that of moving the segment and that of moved it. In some cases the last was impaired without the impairment of the first. He referred to Mr. Steadman's method of gauging the appreciation of muscular sense by seizing the segment by the side.

In regard to the surgical aspect of the operation, drainage did not require that the convexity of the flap should be downward. In his second case he had sloughing of the dura from division of the temporal artery by this procedure. He now cut the convexity of the flap upward and backward. With the patient lying, full drainage was secured. The speaker used the spray for the purpose of continuous irrigation. He had tried intermittent irrigation, but found that it did not do so well.

DR. W. W. KEEN stated that he found irrigation unnecessary, washing with sponges being all that was, in his opinion, required.

DR. GRAY was glad to hear so conservative a rule as five years for determining the cure of focal epilepsy. Even in idiopathic epilepsy the duration of the intervals between the attacks varied enormously at different times. In several cases in his experience the fits had been absent for three or four years. In one case, that of an intelligent man, there was cessation for ten years. In regard to the question of cure in reflex epilepsy, he referred to a case of petit mal, in which the cure of a vaginitis was followed by recovery, also to a case of the laryngeal type in which there was cessation for several years after the removal of the growth. He also referred to a case in which the convulsion was limited to the hand. Frank W. Rockwell had cut down, incised the dura, and found a growth of a dark color, supposed to indicate a gliomatous formation; he did not excise, but the convulsions were absent for four months.

following. Now, however, they were as bad as before. In another, a case of intracranial syphilis, the convulsion was limited to one upper extremity, and operation was determined upon. The operator, however, not believing in antisepsis, the patient died from violent acute encephalitis, the brain being honeycombed with pus.

DR. DANA had understood Dr. Lloyd to state that there was some disturbance of the sensibility in the fingers; he had also stated that there had been a loss of the sensory aura present before the operation. It was hardly fair to say that the cutaneous sensibility was not disturbed. Further, the part excised was small, the sensory centres occupied a space larger than those of the motor centres.

DR. MILLS shared Dr. Ferrier's impression that true cutaneous sensibility was not destroyed in this case. The method of examination with the sharp and blunt points of the aesthesiometer was defective. Great variations would be found even in the present company in regard to these tests. The personal equation made a great difference. Blindfolded, this patient would instantly detect the gentlest impression, the lightest touch or breath upon the skin. When given objects of peculiar shapes, he would fail to recognize them, apparently because unable to run the fingers over them as in the other hand. His difficulty lay chiefly in motor inability to apply the tests.

MR. HORSELY stated that so far as he knew he had been the first to propose the blindfold test, the patient with his forefinger indicating the point touched. He referred, too, to the fact that if the representative of a whole segment was removed with marked loss of tactile sensibility, recovery proceeded from the proximal end downward, the same as the anaesthesia of hysteroid cases.

DR. SEGUIN would place upon record the fact that the patient operated upon by Dr. Weir last year is now in a fair condition of recovery. During the summer he had had a few convulsions, affecting the right hand and cheek. There is no headache or choked disk. There is more paresis of the right arm than in the summer. There was unquestionable anaesthesia of the cheek, hand and forearm to contact tests as well as to the esthesiometer. The

patient does not feel slight contact tests unless there is some indication in the temperature of the object applied. He estimates small differences in weights. There is also anaesthesia of the lower part of the face, the lips, and the inside of the cheek.

DR. GODFREY, of Bridgeport, has recently found that the patient does not taste sugar upon the right side of the tongue. The wound in this case involved a piece of the cortex and adjacent white matter one inch in diameter and of considerable depth, as the growth had to be scooped out.

DR. FERRIER asked what was the character of the sensibility in the leg and trunk.

DR. SEGUIN replied that in the leg it was normal. In the trunk he could not say.

DR. FERRIER asked what was the situation of the tumor.

DR. SEGUIN replied that it occupied the caudal extremity of the second frontal, extending partly under the praæ-central, covering the face and arm centres.

DR. FERRIER asked whether it extended to the longitudinal tissue.

DR. SEGUIN replied that it was situated two-thirds of the way down to the fissure of Sylvius.

DR. FERRIER asked what was the size of the tumor.

DR. SEGUIN replied that it was about eighteen mm. across and almond-shaped. It was a sarcomatous growth.

DR. LLOYD stated that he had not referred to the pathological examination in his case, because not yet complete; but he had been told by the pathologist this morning that there was evidence of degeneration in the large pyramidal cells. When he had said that the patient was cured, he had simply meant, that so far the patient had been relieved. Previous to the operation he had been having as many as twenty-eight convulsions in a day, and since the operation he had not had one authentic attack. If in the future recurrence takes place, he would not neglect to report it. While the tests for muscular and tactile sensation were not very exact, perhaps, he thought that the patient did have some difficulty in locating the point of contact, he would mistake one finger for another. It seemed to the speaker that the fact of a sensory aura in the case showed that sensation was inherent in the cortex.